Claims

1 A system for automatic process control comprising an empirical prediction model of a process having an input space comprising input boundaries, the model requiring empirical data, and wherein at least some data for the empirical prediction model is simulated data.

2. A system according to claim 1, wherein the simulated data is data obtainable from a first formula describing the process.

3. A system according to claim 2, wherein the first formula is obtainable by regression from a data set of experimental results of the process run at least at its input boundaries.

4. A system according to claim 3, wherein the simulated data is obtainable from said first formula at desired points across said input space.

5. A system according to claim 4, wherein said data set comprises the results of experiments having input conditions and whose input conditions are definable by a geometric spacing of said experiments across said input space.

6. A system according to claim 5, wherein said geometric spacing is selectable to give an even spread of experiments across said input space.

7. A system according to claim 5, wherein said geometric spacing is selectable to cover at least the input boundaries and a center of the input space.

8. A system according to claim 5, wherein said geometric spacing is in accordance with DOE predetermined placing rules.

9. A system according to claim 2, wherein said first formula is any one of a group comprising a linear formula, a linear formula with interaction between inputs, a quadratic formula and a quadratic formula with interaction between inputs.

10. A system according to claim 1, wherein said input space is divisible into discrete regions, and wherein said empirical model comprises predicted process outputs associated with each discrete region.

11. A system according to claim 9, wherein said input space is divisible into discrete regions, and wherein said empirical model comprises predicted outputs associated with each discrete region.

12. A system according to claim 11, wherein results for said predicted outputs are producible by said first formula and obtainable from running said process. said results being interchangeable within said empirical

model.

13 A system according to claim 12, further having an empirical results quantity assessor for interchanging results produced by said first formula with results obtained from running said process when said results obtained from running said process are assessed to be statistically significant according to at least one predetermined criterion of significance.

14. A system according to claim 12, having a prediction quality assessor for interchanging results obtained by running said process with results obtained from said first formula when a prediction of said empirical model is assessed to diverge significantly from an outcome of said process according to at least one predetermined criterion of significance.

15. A system for automatic control of a process, comprising a process model using data and further comprising a data model for generating data for said process model and an empirical data extractor for extracting data from said process for said model, and wherein said data used by said process model is interchangeable between data obtained by said data model and data obtained by said extractor.

16. A system according to claim 15, further comprising a prediction quality assessor for interchanging results obtained by said extractor with results

obtained from said data model when a prediction of said process model is assessed to diverge significantly from an outcome of said process according to at least one predetermined criterion of significance.

17. A system according to claim 15, further comprising an empirical results quantity assessor for interchanging results produced by said data model with results obtained by said extractor when results obtained from running said process are assessed to be statistically significant according to at least one predetermined criterion of significance.

18. A system according to claim 15, wherein said process model is a lookup table.

19. A system according to claim 18 wherein said lookup table comprises output values for discrete regions of an input space within which said process is operable.

20. A system according to claim 15, wherein said data model is a formula obtainable from outputs of said process associated with geometrically spaced points of an input space within which said process is operable.

21. A system according to claim 20, wherein said formula is any one of a group comprising a linear formula, a linear formula with interactions, a

quadratic formula and a quadratic formula with interactions.

22. A system according to claim 20 wherein said geometrically spaced points are evenly distributable about said input space.

23. A system according to claim 20 wherein said geometrically spaced points comprise points placed on the boundaries of said input space and a point placed at a center of said input space.

24. A method of automatically controlling a process, using a data-based process model comprising the steps of

generating data for said process model using a data generation formula, and

controlling said process using said generated data in said process model.

25. A method according to claim 24, wherein said process has an input space and said data generation formula is obtained by running said process at preselected points in said input space.

26. A method according to claim 25, wherein said preselected points are orthogonally placed in said input space.

27. A method according to claim 25 wherein said preselected points

are evenly spaced in said input space.

28. A method according to claim 25, wherein at least some of said preselected points are placed at boundaries and a center of said input space.

29. A method according to claim 24, further comprising a step of replacing said generated data with data empirically obtained during the running of the process.

30. A method according to claim 29, wherein said step of replacing said generated data is carried out when said data obtained empirically has reached a threshold of significance according to at least one predetermined significance criterion.

31. A method according to claim 29 further comprising a step of reverting to data generated using a data generation formula.

32. A method according to claim 31, wherein said step of reverting is carried out when results predicted by said data-based process model are detected to diverge from empirically measured process results by an amount exceeding a threshold of significance according to at least one predetermined significance criterion.

33. A method according to claim 25, comprising the steps of

building a formula for a first input space,

obtaining process output data for said first input space,

building a formula for a second input space,

obtaining process output data for said second input space,

comparing said process output data for said second input space with process output data for said first input space,

on the basis of said comparison selecting a third input space for obtaining process output data,

and operating said process in an optimal one of said input spaces.